

CLAIMS

What is claimed is:

1. A method of designing a biodegradable/bioresorbable tissue
5 augmentation/reconstruction device, said method comprising:
creating a material density distribution within a device design
shape for discrete points during a material degradation lifecycle;
weighting said material density distribution using a weighting factor
to determine a weighted density;
10 using said weight density to determine a material reinforcement of
said device such that said device will retain predetermined structural properties
during said material degradation lifecycle.
2. The method according to Claim 1 wherein said material density
15 distribution is creating using a technique chosen from the group consisting
essentially of topology optimization, microstructure topology optimization,
restricted topology optimization, image-based design, and computer-aided
design techniques.
- 20 3. The method of Claim 2 wherein said topology optimization includes
an algorithm employed to define said material density distribution at
predetermined time points during said material degradation lifecycle.
4. The method of Claim 2 wherein said image-based design includes
25 defining said material density distribution at predetermined time points during
said material degradation lifecycle.
5. The method of Claim 2 wherein said general computer aided
design techniques include defining said material density distribution at
30 predetermined time points during said material degradation lifecycle.

6. The method according to Claim 1 wherein said weighting factor is chosen from the group consistently essentially of a linear weighting factor, a nonlinear weighting factor, a time past degradation factor, and a ratio of a degraded material property to initial material property.

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7. The method according to Claim 6 wherein said ratio of a degraded material property to initial material property includes a ratio of a degraded modulus to an initial modulus.

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8. The method according to Claim 6 wherein said ratio of a degraded material property to initial material property includes a ratio of a degraded strength to an initial strength.

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9. The method according to Claim 6 wherein said ratio of a degraded material property to initial material property includes a ratio of a degraded thermal conductivity to an initial thermal conductivity.

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10. The method according to Claim 6 wherein said ratio of a degraded material property to initial material property includes a ratio of a degraded electrical conductivity to an initial electrical conductivity.

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11. The method according to Claim 1, further comprising:
superposing said material density distribution at predetermined time points using both time, degraded base stiffness, and said weighting factor.

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12. The method according to Claim 1, further comprising:
superposing said material density distribution at predetermined time points using density at a global anatomic level.

13. The method according to Claim 12, further comprising:
superposing said material density distribution at predetermined
time points using density at a physical size smaller than said global anatomic
level.

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14. The method according to Claim 1 wherein said weighting said
material density distribution using a weighting factor to determine a weighted
density further includes employing material degradation kinetics to enhance said
material density distribution.

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15. The method according to Claim 14 wherein said employing
material degradation kinetics further comprises employing one chosen from the
group consisting essentially of polylactic acid, polyglycolic acid, polyanhydride,
polycaprolactone, tri-calcium phosphate, and hydrogels.

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16. A method of manufacturing a biodegradable/bioresorbable tissue
augmentation/reconstruction device, said method comprising:

dividing the device into elements having a predicted material
density between 0 and 1;

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weighting each predicted material density by a predetermined
degradation profile to define a weighted material density, said degradation profile
being unique to a material used; and

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calculating a material weight in each of said element by applying a
time lasting factor and a degrading modulus factor such that high load bearing
regions within said device are reinforced to compensate for subsequent stiffness
degradation due to bulk erosion of said device.

17. The method according to Claim 16, further comprising:
converting said weighted material density to surface representation
for manufacture.

5 18. The method according to Claim 17 wherein said converting said
weighted material density to surface representation for manufacture includes
converting said weighted material density to a STL surface representation.

10 19. The method according to Claim 17 wherein said converting said
weighted material density to surface representation for manufacture includes
converting said weighted material density to a Computer Aided Design (CAD)
surface.

15 20. The method according to Claim 17 wherein said converting said
weighted material density to surface representation for manufacture includes
converting said weighted material density to a wireframe representation.